

Global Retrieval of Aerosol Properties from Sources to Sinks By MODIS

N. CHRISTINA HSU

NASA Goddard Space Flight Center, Greenbelt, MD, USA

Mineral dust and smoke aerosols play an important role in both climate forcing and oceanic productivity throughout the entire year. Due to the relatively short lifetime (a few hours to about a week), the distributions of these airborne particles vary extensively in both space and time. Consequently, satellite observations are needed over both source and sink regions for continuous temporal and spatial sampling of dust and smoke properties. However, despite their importance, the high spatial resolution satellite measurements of these aerosols near their sources have been lacking.

In this paper, we will demonstrate the capability of a new satellite algorithm to retrieve aerosol optical thickness and single scattering albedo over bright-reflecting surfaces such as urban areas and deserts. Such retrievals have been difficult to perform using previously available algorithms that use wavelengths from the mid-visible to the near IR because they have trouble separating the aerosol signal from the contribution due to the bright surface reflectance. The new algorithm, called Deep Blue, utilizes blue-wavelength measurements from instruments such as MODIS and SeaWiFS to infer the properties of aerosols, since the surface reflectance over land in the blue part of the spectrum is much lower than for longer wavelength channels.

We have validated the satellite retrieved aerosol optical thickness with data from AERONET sunphotometers over land, including desert and semi-desert regions. The comparisons show reasonable agreements between these two. Our results show that the dust plumes lifted from the deserts near India/Pakistan border, and over Afghanistan, and the Arabian Peninsula are often observed by MODIS to be transported along the Indo-Gangetic Basin and mixed with the fine mode pollution particles generated by anthropogenic activities in this region, particularly during the pre-monsoon season (April-May). These new satellite products will allow scientists to determine quantitatively the aerosol properties near sources using high spatial resolution measurements from SeaWiFS and MODIS-like instruments.